

Jan Ferguson

Remote Sensing Aids Archeological Investigations

Orville Wright piloting the Wright Model E over Huffman Prairie Flying Field. The Model E carried the automatic stabilizer that earned Orville the Aero Club of America trophy for 1913. It also was one of the only two Wright models with a single propeller. Photo courtesy Wright State University Archives, Wright Brothers Collection.

In 1994, a team of archeologists from the U.S. Army Construction Engineering Research Laboratories Tri-Services Cultural Resources Center (USACERL) conducted archeological investigations at the 1910 hangar location within the Huffman Prairie Flying Field site located on Wright-Patterson Air Force Base, near Dayton, Ohio. This work expanded on archeological testing conducted by USACERL in 1990, and confirmed the results of 1993 airborne remote sensing studies by the Earth Observation Research Office of the Science and Technology Laboratory of the National Aeronautical and Space Administration's (NASA) John C. Stennis Space Center and 1993 ground-level geophysical studies of the hangar area by the Waterways Experiment Station of the U.S. Army Corps of Engineers (CEWES). All except the 1990 USACERL studies were funded by the Department of Defense's Legacy Resource Management Program. The 1990 USACERL archeological investigations suggested the presence of the 1910 hangar as an archeological component of the Huffman Prairie Flying Field site. The remote sensing investigations revealed magnetic anomalies and images believed to be associated with the hangar structure and significantly narrowed the focus of the area to be subsurface tested. The 1994 archeological investigations at these target areas located an *in situ* post, posthole features, and artifacts associated with or actually from the hangar. These results verify the location of the 1910 hangar, provide a basis for management of this significant site, and add another to the growing list of success stories resulting from utilizing remote sensing techniques to maximize the results of archeological field work while minimizing ground disturbance.

Huffman Prairie Flying Field is a National Historic Landmark and is part of the Dayton Aviation Heritage National Historical Park. Wilbur and Orville Wright moved to this 84-acre site after their first flight in Kitty Hawk, North Carolina in 1903. From 1904 through 1905 the Wright brothers mastered the principles of manned powered



flight at this site and developed the world's first practical airplane. At this site the Wrights also operated the world's first permanent flight school from 1910 to 1916, where they trained 119 of the world's first pilots, and operated a support base for exhibition flying in 1910 and 1911. Never containing more than a single hangar and one or two outbuildings at any given time, today the site lies in the floodplain just at the end of the active runways at Wright-Patterson Air Force Base and remains much as it did when the Wright brothers worked there. None of the original buildings are still standing. In 1990, the Air Force constructed a replica of the 1905 hangar in its approximate original location. No other buildings are on site.

The Wright brothers believed strongly in the scientific method and kept detailed records of their experiments with early aircraft, both at Kitty Hawk and at Huffman Prairie Flying Field. While these records tell us what the Wrights were doing at the site, they don't tell much about how the site was actually used, on a day-to-day basis, particularly during the 1910 to 1916 phase of occupation at the site. During this time a variety of activities were taking place at the site—pilot training, exhibition flying, and field testing of new models of aircraft being developed by the Wright Aeronautical Company in Dayton—all operating out of the 1910 hangar. Although the hangar is shown on a few maps and aerial photographs of the time, several of the key landmarks in these documents are now missing. With the creation of the Dayton Aviation Heritage National Historical Park and the National Historic Landmark designation, there is greater need for the base to increase its knowledge of the site overall and to better understand the 1910 to 1916 phase.

The first attempt to locate the 1910 hangar was carried out in 1990 by USACERL. Extensive subsurface testing designed to locate foundations or driplines associated with the hangar produced a large quantity of artifacts but did not uncover any *in situ* archeological features. A change in strategy was needed to get to the information we strongly suspected was down there, while limiting the subsurface disturbance we did to the site. When the

base received DoD Legacy funding for USACERL to do additional work at the 1910 hangar site, USACERL contracted with NASA and CEWES to perform remote sensing, including geophysical studies.

The NASA study took place between May and August of 1993. Because of the wealth of information that can be obtained from airborne remote sensing instruments, NASA offered to overfly the entire installation and to select the optimum available instruments to address a wide range of research interests at the base, beyond just the 1910 hangar project. Ultimately NASA used airborne imaging techniques (the Calibrated Airborne Multispectral Scanner, or CAMS, which contains a single, broad-range thermal band, and the Inframetrics Model 740 scanner, a lightweight thermal unit used primarily in support of the space shuttle program and one of the most powerful thermal instruments commercially available) and color infrared aerial photography. Preliminary data analysis suggests that CAMS data could be useful for a wide range of activities, such as wetlands delineation and facilities management. While scheduling difficulties meant that the CAMS data was collected at not the most optimum time of the year for detecting features associated with the 1910

hangar, several anomalies indicating potential features could be seen in both the CAMS and the Inframetrics data. The anomalies detected were then spatially pinpointed using extant landmarks, historical documents, and archeological data. The anomalies appeared to indicate

the rectangular “footprint” of the hangar (either architectural elements of the hangar itself or thermal soil anomalies resulting from activities associated with the building) and the remains of Symmes Road, which used to pass just behind the hangar.

The CEWES study took place in October 1993, and consisted of three geophysical methods—magnetic surveying, electro-magnetic surveying, and ground-penetrating radar. Anomalies detected were assessed as possible indications of the hangar, with particular attention paid to anomalies detected by multiple methods. These were then interpreted in comparison with a 1915 map and 1924 aerial photo of the area, both of which show the 1910 hangar.

The 1994 USACERL investigations were undertaken to ground-truth the results of the

CEWES survey; the NASA survey results were not available at the time of the 1994 excavation, but were used later as part of the data analysis. USACERL's 1994 strategy was designed to minimally impact the 1910 hangar locus, through the use of limited machine testing and large hand-excavated units to identify architectural remains of the post-in-ground structure. USACERL limited the work to a portion of the hangar locus deemed likely to reveal discernible archeological features. Execution of this strategy was complicated by difficulties in coordinating the CEWES survey grid and the 1990 and 1994 survey grids. The 1994 excavations succeeded in locating several subsurface features, including an *in situ* wooden post, a posthole, and a possible posthole. The features were compared to the remote sensing anomalies and the 1915 map. The detection of these features suggests that the Huffman Prairie Flying Field includes *in situ* architectural remains located in the general vicinity of the 1990 and 1994 excavations and the anomalies detected by the airborne and geophysical remote sensing studies.

The remote sensing studies and archeological fieldwork have contributed to several significant findings. Despite having been bulldozed c. 1940, extensive subsurface remains, including artifacts and architectural remains, of the 1910 hangar locus are present on the Huffman Prairie Flying Field site. Artifact concentrations occur, but in some cases are displaced as a result of the bulldozing and plowing performed during hangar demolition. Artifacts are relatively abundant and are dominated by construction materials. Airplane parts, though few in number, give important information about the repair and operation of early aircraft. Domestic artifacts, principally fragments of glass beverage bottles, provide a glimpse into the daily lives of the pilots, mechanics, and others who worked at the 1910 hangar. The hangar itself may also provide detailed information on the design and construction of one of the world's earliest airplane hangars. The investigations are part of a continuing effort by Wright-Patterson Air Force Base to manage Huffman Prairie Flying Field and to develop it as a resource for public information and education. Finally, the investigations demonstrate the utility of applying remote sensing techniques to archeological sites. Although the target of the remote sensing surveys was an ephemeral, post-in-ground structure, and the studies were done in non-optimal seasons, both sets of techniques were able to locate indications of the hangar structure.

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Chevon Kathari, left, and Rafe Kinoshita of the U.S. Army Construction Engineering Research Laboratory gather data at the 1910 hangar excavation site.

